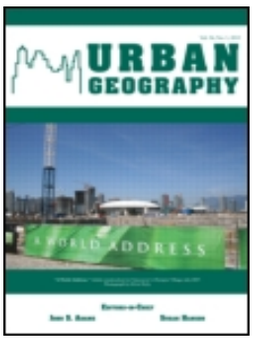

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Incremental infrastructures: material improvisation and social collaboration across post-colonial Accra

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Approaching the informal construction and extension of infrastructures through the terrain of what I term "the incremental" opens up new platforms of analysis for post-colonial urban systems. This refers to ad hoc actions on the part of slum dwellers to connect to energy networks or carve out informal living spaces. I argue that incrementalism is produced and subsequently secured and scaled through material configurations that seek to test and prefigure new forms of infrastructure and accompanying resource flows. I use a case study of energy and housing systems in a low-income neighborhood in Accra to define and examine these incremental infrastructures. I examine shifts in the Accra energy network as urban dwellers rework connections to flows of electricity. I also consider the material adjustment of housing and the role of cooperation in responding to threats of demolition and displacement. Together, incremental infrastructures and the ways that they are constituted articulate a prefigurative politics in which residents seek to generate access to new infrastructural worlds.

Keywords: incremental infrastructures; improvisation; post-colonial cities; prefigurative politics; Accra

Introduction

The incremental nature of infrastructure construction and extension has become an important focus in examinations of post-colonial urban worlds (McFarlane, 2011b; Simone, 2008, 2013) in the context of the second wave of urbanization and debates concerning global urbanism. Research in urban studies is increasingly focused on how marginalized populations seek to construct or reconfigure urban systems. What I refer to as incremental infrastructures, from new electricity connections creating free circuits of energy to low-cost, self-built housing systems, form the basis for investigation in this paper. As marginalized urban dwellers confront multiple inequalities and difficulties in accessing resources, they often intervene in configurations of infrastructure in order to shift socio-environmental conditions and metabolisms of energy and other resource flows that sustain urban life. Incremental infrastructures can thus be understood as in-the-making, undergoing constant adjustment and intervention, and in a permanent state of flux. This ceaseless reconfiguration of urban networks is thus an important site from which to analyze the sociomaterial production of cities (Lawhon, Ernstson, & Silver, 2014) and to map conditions of possibility (Loftus, 2012). This paper seeks to contribute

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to such work through a detailed reflection of informal urban systems and their political possibilities in Accra, Ghana.

The focus on the incremental nature of infrastructure presents both a series of challenges and openings for scholars working in cities such as Accra. Growing critiques of urban theory production articulate the need to generate new conceptual vectors that engage with actually existing urban conditions across the Global South (Edensor & Jayne, 2011; Lawhon et al., 2014; Myers, 2011; Robinson, 2006; Robinson & Parnell, 2011; Roy, 2009a). These critiques call for additional research on the emergent urban futures being generated in the poor urban spaces of the Global South. I use the case study of Accra to analyze the ways in which urban dwellers seek to adjust circulations of energy and to reshape housing conditions. The stark socio-environmental inequalities present in Accra (Grant, 2009; Songsore, 2009) lead to the research task of investigating energy deprivation, housing need, and poverty alleviation. State planning and investment in the energy and housing systems of the city of course provide important ways in which to transform (both incrementally and at a larger scale) infrastructure conditions and address multiple development issues being faced by countries such as Ghana. Equally, the terrains of the incremental beyond the state (Rao, 2006; Swilling, 2011) in slums of countries such as Ghana are also generating openings in which poor urban dwellers themselves address socio-environmental injustices in the city, prefigure futures, and compose new infrastructural conditions.

In this paper, I contribute to the growing literatures on post-colonial urban worlds by proposing a new perspective about notions of incrementalism beyond or at the margins of the state/capital nexus, focusing on a specific articulation of this concept and the ways in which such forms of infrastructure are constituted and consolidated. I suggest that incremental infrastructures should be understood as in-the-making, under constant adjustment, and shifting technological and material configurations. I point to the ways that these incremental infrastructures are predicated on improvisation and social collaboration amongst urban dwellers. I argue that drawing attention to the prefigurative nature of material and social interactions across such infrastructures can help to reveal the conditions of possibility that residents are generating across urban space in cities such as Accra.

I begin by providing an overview of the conceptual debates that situate this work, followed by an explanation of the research undertaken and the context in which it is shaped. I go on to examine the notion of incremental infrastructures before specifying the material and social constituents of such systems. I conclude by outlining some key theoretical considerations generated from thinking through the relationships between these forms of infrastructure.

Reworking notions of urban infrastructure

Pieterse (2008) argues that many researchers' failure to recognize actual existing conditions in African cities is predicated on inappropriate conceptual models of the urban that nevertheless continue to inform the theories used to understand urbanization in post-colonial cities. The strategy I propose to engage with post-colonial urbanization is to reveal the incremental ways in which urban dwellers reconfigure infrastructures at the neighborhood or household scale. Such an approach can help to frame these urban geographies, as Simone (2008, 2013) eloquently elucidates, as noticeably incremental. While, for example, urban political ecology literatures have examined the terrains of the everyday (Lawhon, 2013; Loftus, 2012; Myers, 2011; Shillington, 2011) that have expanded and situated historical materialist conceptions of the urban (Harvey, 1996; Smith, 1984; Swyngedouw, 2004), a focus on the incremental may help to shift debates beyond the often frustrating tensions between divergent ways of knowing,

theorizing, and politicizing urban infrastructures. Working through the incremental can provide one response to Pieterse's (2008) challenge of revealing the actual existing conditions of cities such as Accra. In this paper, I argue that a focus on the incremental nature of infrastructure systems can bolster a growing body of work across urban studies in Africa, and the Global South more generally, that seeks to elucidate how urban networks and processes "touch down" in neighborhood and household spaces (De Boeck & Plissart, 2004; Diouf, 2003; Edjabe & Pierterse, 2010, 2011; Harts-Broekhuis, 1997; McFarlane, 2008; Njeru, 2006; Simone, 2004a, 2004b, 2010). This work provides important ways to link micro scales to wider circulations of people, technologies, and ways of inhabiting cities that diverge from the urban trajectories and futures of Global North cities (Robinson, 2006; Robinson & Parnell, 2011; Roy, 2009a). Furthermore, this work helps to frame the incremental nature of infrastructures through the multiple ways in which urban space is being reconfigured. It also highlights the influence and agency of urban dwellers in shaping these configurations and, by extension, the wider geographies of post-colonial urban worlds.

In considering Johannesburg, Mbembe and Nuttal (2004, p. 369) suggest a useful way of thinking through the urban life of cities such as Accra: "Like the [African] continent itself, [urbanization] is an amalgam of often disjointed circulatory processes…it has become, in spite of itself, a place of intermingling and improvisation." Here, Mbembe and Nuttal suggest that formally planned infrastructure, authorized and built by the state and private sector, exists in relationship to informal infrastructures that are in-the-making, provisional, and often temporary. This notion of incremental infrastructures has been considered in more detail by Simone (2008, 2011) and McFarlane (2011b), who analyze how urban dwellers seek to improve household or neighborhood conditions through multiple and unfolding encounters with urban infrastructural configurations. This important work on the incremental suggests that across urban spaces (and in contrast to larger scale investment by either market or state mechanisms), residents are engaged in another, informal series of encounters with networks, socio-environmental conditions, and configurations of infrastructure. This process is a constant and unfolding dialectic of adjustment and readjustment that may be unsanctioned and often officially (and in many cases arbitrarily) illegal (Roy, 2009b).

Incremental interventions address conditions of poverty, making possible flows of energy into households, create new housing configurations, otherwise serving to channel resources toward the living of marginalized urban lives. These interventions exist at the periphery of city planners' official, mapped and regulated circuits of energy, and infrastructure development. It is in these spaces and through these activities that the urban poor generate new infrastructural geographies, making small changes to material and social relations both within the home or the wider neighborhood. Through these acts, residents in low-income neighborhoods work hard to sustain not only survival in the city but to bring forth new conditions of possibility. As Simone (2004b, p. 428) argues:

> With limited institutional anchorage and financial capital, the majority of African urban residents have to make what they can out of their bare lives. Although they bring little to the table of prospective collaboration and participate in few of the mediating structures that deter or determine how individuals interact with others, this seemingly minimalist offering—bare life—is somehow redeemed. It is allowed innumerable possibilities of combination and interchange that preclude any definitive judgment of efficacy or impossibility.

While state investment may provide new or improved infrastructural conditions, the role of urban dwellers in generating new urban trajectories must not be sidelined by research

that attempts to address issues of social and environmental justice. Inattention to non-formalized activities undertaken by poor urban residents is a consistent gap in research on post-colonial African urbanization. As Pieterse (2008, p. 14) makes clear, "Whether one is in favor of state-driven development or not, it is self-evident that a large part of the resolution of the African urban crisis will come from the efforts of the urban poor themselves."

While the contours of incremental infrastructures have been articulated in past work on post-colonial urban dynamics, the ways in which such infrastructures are constituted has received less attention. This paper proposes that incrementalism is produced and subsequently secured and scaled through experiments in material configurations that seek to test and prefigure new forms of infrastructure and accompanying resource flows. As noted above, this improvisation is driven by poverty, something Gandy (2005, p. 46) writing on Lagos makes clear: "With the high prices of imported food, clothing and other essential goods, and average earnings of less than a dollar a day, the day-to-day survival strategies of many households depend upon barter and improvisation." The notion of improvisation provides a way to consider the shifting materialities of incremental infrastructures and how they unfold across urban space. This improvisation creates new network spaces and connections, improved housing conditions and often temporary configurations of infrastructure. As McFarlane (2011a, p. 216) argues in the context of Mumbai, "Housing within informal settlements is typically—though not exclusively—constructed individually and incrementally, using locally available materials, and often clustered in ways that depend on closely shared roofs, walls and infrastructures." Yet incremental infrastructures cannot simply be understood as a series of shifting material conditions and configurations. They are also, crucially, social collaborations. Through their actions, poor urban dwellers are enrolling themselves within the infrastructures of post-colonial urban worlds (Simone, 2004b). Thus, I argue that the movements and circulations of people should be considered forms of infrastructure themselves.

Past scholarship has also suggested that urban dwellers engaged in informal activities in African cities become more than actors in the reconfiguration of networked urban systems. For example, Greico (2008) argues that the role of child labor as an alternative sanitation infrastructure in Ghana stretches and extends the definition of infrastructure. Simone (2004b, pp. 407–408) defines "people as infrastructure," suggesting that urban scholarship must "extend the notion of infrastructure directly to people's activities in the city." He notes that:

> African cities are characterized by incessantly flexible, mobile, and provisional intersections of residents that operate without clearly delineated notions of how the city is to be inhabited and used. These intersections, particularly in the last two decades, have depended on the ability of residents to engage complex combinations of objects, spaces, persons, and practices. Conjunctures of urban dwellers *become an infrastructure*, a platform providing for and reproducing life in the city. (emphasis added)

As such, it is important to frame the constitution and consolidation of incremental infrastructures as consisting not simply of the shifting materialities of hardware but also as forms of social collaboration through which urban dwellers undertake functions integral to the continued circulation and reproduction of city life.

Bringing together both material improvisation and social collaboration, this paper is aimed at more clearly explicating how incremental infrastructures are constituted and consolidated. This framing can help scholars to understand the role of incremental

infrastructures in generating conditions of possibility (Loftus, 2012). As Swyngedouw (2004, p. 116) argues, "emancipatory urban politics reside in acquiring the power to produce urban environments in line with the aspirations, needs." I follow Swyngedouw in arguing that the incremental ways in which urban dwellers seek to adjust resource flows, reshape materialities, and experiment with multiple urban futures illustrate the power they have to address unequal urban conditions. Lawhon et al. (2014, p. 507) have set out the contours of an urban political ecology based on emergent urbanisms across African cities that provides an important point of departure for thinking through incremental infrastructures; they argue that

> The base for theorization here is the ordinary practices of city-making, including how relations are formed and stabilized, how the city is made to work to secure livelihoods and identities and how people scale themselves through their networks to access resources and opportunities.

The purpose of such work should not be merely to describe these urban dynamics but should be aimed at revealing the prefigurative political horizons opening across post-colonial urban spaces for marginalized communities (Pickerill & Chatterton, 2006).

Researching Accra's infrastructures

Accra is a fast-growing city situated on the Gulf of Guinea and is one of West Africa's most important economic hubs. Ghana's urban population, now predicted to be at 51% of the country's total (UN-Habitat, 2007) includes many new urban dwellers living in conditions of poverty and socio-environmental marginalization (Songsore, 2009). Researchers have characterized this process as the "urbanization of poverty" (Ravallion, 2002). Rapid urbanization (of poverty), it has been predicted, will account for nearly all population growth in Africa and is already generating a series of competing demands. These include the delivery of basic services in urban spaces visibly lacking infrastructure systems, the upgrading of existing infrastructure, and support to residents unable to tap into adequate housing and flows of resources that are vital to urban life. Accra remains a city divided by socio-environmental inequality, and unequal access to formal, networked services continues to reinforce unequal social relations (Graham & Marvin, 2001). Alternative strategies used by the urban poor to connect to resource flows, coupled with tactics for improving housing conditions, illustrate how incremental infrastructure configurations, often temporary in nature, support precarious livelihoods.

Methodology

To examine these incremental infrastructures, I conducted ethnographically informed research over 6 months in 2010 and 2011 in Accra. The aim was to study the intersections between housing conditions, the energy network, and urban dwellers in low-income neighborhoods. The main site of this work was the community of Ga Mashie, and I also gained insights through living in Osu, another centrally located neighborhood. These neighborhoods, with existing energy infrastructure and some level of formal housing, were selected in line with the research aim of examining the ways that existing infrastructure systems are being reconfigured. A research assistant and I arranged small discussion groups across different parts of Ga Mashie and spent time walking around the neighborhood, learning about the intersections of infrastructure and urban life for

residents. The research sought to build a detailed analysis of the incremental geographies of the area. This ethnography was supported by a number of complimentary research activities, including 15 interviews with key stakeholders in Ga Mashie and with assorted urban intermediaries in other parts of the city. A qualitative, 35-household survey also helped to access a wider section of research participants. The aim of these multiple research avenues was to follow Merrifield's (2002, p. 14) proposal that "truth claims about cities must be conceived from the bottom upward, must be located and grounded in the street, in urban public space."[1]

The neighborhood of Ga Mashie

James Town or Ga Mashie as it is known locally (and referred to throughout this paper) is an older neighborhood in central Accra. It is often termed 'Old Accra' due to its historical relationship to colonial activity in the city, and it was also a key site in the development of housing and energy infrastructure in the city. As a local politician explained to me, "James Town is a historical point of interest for energy in Ghana. It was one of the first places to have electricity but not for the community until the Nkrumah era." For many years, the residents experienced urban life without important services or adequate housing, in contrast to the emerging networked services in the residential and adjacent commercial spaces of the British colonizer. In the 1930s, Ga Mashie became a key site for Ghana's burgeoning independence movement. Protests by war veterans and the 1951 election of Kwame Nkrumah added to the neighborhood's historical importance to the city and nation. After independence President Nkrumah's modernization vision for the country included the development of a central business district in Accra, and Ga Mashie has been and continues to be targeted for slum clearance to make way for these plans. "The government attempted to clear Ga Mashie and surrounding areas multiple times, but the demolitions have been resisted successfully by community leaders and members of the opposition party" (Hess, 2000, p. 54). The specter of demolition continues to haunt residents in Ga Mashie, echoing the overlapping modes of urban governance that have existed throughout different eras, as well as the precarious nature of housing in the neighborhood. Though the neighborhood is a vibrant center, it is officially classified as a slum, with severe overcrowding of its estimated 125,000 residents (Ghana Statistical Service, 2012). The neighborhood suffers from a series of socio-environmental hazards that place it in the most severe category of environmental burdens for areas in the Greater Accra Metropolitan Area. These include "inadequate potable water supply, unsanitary conditions, insect infestation, uncollected garbage, poor waste water disposal, smoky kitchens, crowding and shelter poverty" (Songsore, 2009, p. 1).

Older people in Ga Mashie remember the installation of the electricity network into the neighborhood as the spearhead for a wider program of modernization in Ghana during the early 1960s. As one research workshop participant explains,

> When Nkrumah was President he made promises to the nation that we would have the electrical power and he constructed the dam. Because of the importance of the harbor for the country then, electrical power came here from around 1965.

The area now has an aging electricity network that is managed by the state-owned Electric Company of Ghana (ECG) and provides extensive services across Ga Mashie. Yet this infrastructure is facing considerable strain due to the increasing population of the area, increased usage of electricity, and lack of investment. The household survey I conducted

shows an average household expenditure of between 6 and 20 Cedis (£1 to £4) per month on electricity credit; the survey reveals that many households struggle to afford a constant flow of electricity to meet daily needs, with just under 80% of household respondents sometimes or often struggling to afford electricity credit for the home. This energy poverty was a key concern for participants in the workshops. The costs of electricity constitute a financial burden for most of Ga Mashie's residents, many of whom survive below the poverty line. Although a lifeline tariff of around $1.50 per month is supposed to be provided by the government as an energy subsidy to the urban poor, this payment to the utility companies is often unpaid. The introduction of prepaid meters (PPM) in 2008 provides a significant source of tension in the relationship between the utility company and residents, and illustrates the ongoing contestation (together with the constant threat of demolition for some residents) over urban space in Ga Mashie. Such urban dynamics provide the context from which residents in the neighborhood seek to incrementally adjust and reshape conditions of poverty and marginalization.

The geography of Ga Mashie's incremental infrastructures

Outlining the contours of incrementalism through the electricity system

This section outlines the geography of incremental infrastructures through the examination of clandestine connections to energy networks. I show that these networks are in a state of constant movement and flux. In Ga Mashie, the reconfiguration of the electricity system is noticeably incremental and provisional. During workshops in the neighborhood, participants articulated the difficulty of sustaining flows of electricity into households. The lack of state or large-scale market investment into the energy network to respond to these issues means that households resort to their own interventions. Many households in Ga Mashie are involved in a series of ongoing actions to construct new network spaces and flows beyond the geographies of the official system and the often restrictive rates of the ECG.

In conceptualizing incremental household actions on the electricity system, I follow Simone's (2013, p. 243) argument that "People figure themselves out through figuring arrangements of materials, of designing what is available to them in formats and positions that enable them particular vantage points and ways of doing things." These ways of reconfiguring the electricity network shape and mediate the circulations of energy into the neighborhood. The research identified a range of these moments of adjustment that incrementally reshape the energy network in Ga Mashie, including a series of clandestine connections that are common across many poor areas throughout the city. As a local politician explains, "Electricity in James Town is a problem. They say it costs too much and they are not able to afford it, so most of us use the illegal connection." It is suggested by both residents and stakeholders, such as at the local ECG payment office, that many people are involved in clandestine connections to the electricity network. Such reconfiguration is normally undertaken with the support of electricians who are sympathetic to the need of households to access unaffordable electricity. An illicit connection can cost up to 50 Cedis, a large up-front investment for most families that is usually negotiated in advance with payments over a number of months.

Another adjustment of the energy network in Ga Mashie involves households or businesses, working again with electricians, to configure a "split" electrical supply system. This involves residents registering and paying for a proportion of their electricity through the ECG network and then using a clandestine connection to access further flows

of energy. Thus, the appearance of paying for electricity is constructed through network participation, with the hopes of avoiding ECG investigations. This type of adjustment is very popular, and is commonly used to sustain small locally based enterprises that operate on tight financial margins.

Alongside such connections to the network that reconfigure the neighborhood's electricity network on an ad hoc, informal basis, other clandestine tactics serve to support households in accessing flows of electricity. The introduction of the PPM acts as a mediating technology or barrier to flows of energy for those households unable to afford the electricity credits from the ECG office. PPMs have become a focus of attention by residents who seek to resist the effects of new technologies that aim to increase revenue for the utility companies. These incremental adjustment actions involve two main activities. First, households without PPM are working together by using the same meter as neighbors and seeking to confuse the ECG about who has responsibility for the bill. However, the ECG has caught onto this strategy and is working to stop joint meter usage through the introduction of more PPMs. This has forced residents to find new pathways of reconfiguration. Another method of accessing underpaid or free electricity is to ask an electrician to come and adjust the meter to stop measuring energy usage, something that can be done with both the PPM and the older meter. Electricians charge between 2 and 10 Cedis for network reconfiguration.

These incremental ways of addressing energy poverty are not always successful or long lasting. Improvements in accessing energy can be reversed, may necessitate bribing a public official, or may even result in criminal proceedings against the household. Each of these potential outcomes highlights the precariousness of slum life in Ga Mashie. The ECG claims that illicit connections threaten its revenues, sustainability, and future investment plans; the ECG employs technicians to go house to house to find clandestine connections to the network, while residents attempt to elide detection and forge new connections. The dialectics of disconnection and reconfiguration across the electricity produce an unmappable infrastructure of movement and flux, becoming and unbecoming.

The multiple strategies developed by residents generate an ongoing, low-intensity conflict between community members and ECG, which plays out through interactions of these different urban actors and the network spaces they seek to direct and control. Residents in Ga Mashie suggest that they are forced to engage in such modifications due to energy poverty, the peripheral status in the urban economy and the introduction of PPM that mediates the flows of energy to the household. Many households in the neighborhood tamper with the PPM to access free or lower cost flows of electricity. Thus, a dialectic exists between the historically mediated metabolic production of infrastructure in the city and the incremental responses by poor urban dwellers. They continuously generate and experiment with a range of other ways of intervening in the electricity network as older methods become obsolete, service providers develop new technologies, or the need for energy increases. These incremental shifts in energy circulation may also be read as the material articulation of a future with lower tariffs or even free energy for marginalized communities, an attempt by the neighborhood not just to envisage but to actually bring about a future of more equitable energy access.

Through focusing on networked, urban poor spaces of Accra, I draw out a set of strategies through which urban dwellers seek to interact, experiment, and intervene with the city's energy network and unequal metabolic flows. These incremental ways of reconfiguring infrastructure show a remarkable tenacity despite the operations of service delivery providers and other urban governance actors in seeking to ensure that flows of electricity are accounted and paid for. This is a process of ceaseless, circulating, and

experimental micro-scale transformations of the urban energy network that moves between and across the geographies of the city's neighborhoods.

It is worth further considering the reasons for such an incrementalism across the electricity networks of Accra's neighborhoods such as Ga Mashie. What is evident from the evidence collected is that adjustments are undertaken in response to the current configurations of flows of energy and wider housing conditions. Poor urban communities are confronted with the need to reconfigure electricity systems to support themselves and their wider social networks through the complexities and metabolic inequalities of contemporary Accra. These activities are undertaken not only for everyday survival, but to open up new possibilities for economic and social improvement. Here, the electricity network becomes a site through which urban dwellers prefigure, imagine, and bring about new infrastructure configurations as a way to reproduce urban life in poor neighborhoods. These findings broaden existing understandings of how urban systems operate, highlighting activities that exist beyond the rationalities and certainties of formalized urban planning. Incremental infrastructures become a way forward for residents in Accra to inhabit the city and to negotiate and navigate the inequalities of networked systems in order to find, consider, test, debate, and withdraw from particular interactions with urban conditions. It is in these urban spaces across and through networks that a significant proportion of residents in Accra live, work, and experience urban infrastructure—always seeking to steer, direct, and to open up (incrementally) new possibilities and opportunities.

Constituting incrementalism through improvisation

I now consider the constitution of incremental infrastructures. This is undertaken through a focus on the material improvisation of urban systems. In Ga Mashie, multiple informal structures have been constructed, generating a vast range of differentiated, improvised housing and evolving networks of family compounds that have developed as the area's population has grown. The historical conception of this type of dwelling can be traced to the earthquake of 1939 that destroyed many of the older colonial buildings and created a legacy of hastily built informal housing. Over the last 50 years, these structures have been gradually strengthened, expanded, decorated, reinforced, and reconfigured. Newer structures are built as urban migration and population growth intensify demand for residential space. Materials used for house construction in Ga Mashie include a range of urban materials: timber planks, mud, scavenged wood, and corrugated iron. Those with more financial resources use sandcrete, concrete, and breeze block (See Figures 1–4).

This vast range of materials demonstrates the improvisation of residents from Ga Mashie in constructing new or improved dwellings. These housing configurations remain in a permanent state of flux, not just through improved infrastructure but through the creation of new spaces, such as cooking or sleeping areas. These improvised housing geographies are thus predicated on material transformation as corrugated iron walls transform into concrete walls, connections are forged to regularized energy supply, and architectural form evolves. Such experiments in material arrangements prefigure improved future conditions for urban dwellers. As such, over time, previously informal dwellings develop the appearance and recognition of formal, robust structures. This solidifies not only the building but the household's status in the community and the perceived right to land tenure.

Improvisation across neighborhood buildings does not simply encompass informal residential dwellings. The older, colonial buildings are also undergoing a process of incremental change through improvised construction. These buildings are being

Figure 1. Improvised housing on the beach in Ga Mashie.
Source: Photograph by author.

Figure 2. Dwelling with multiple materials, including plastic, brick, and iron cladding.
Source: Photograph by author.

Figure 3. Timber-constructed walkway over sewerage.
Source: Photograph by author.

Figure 4. Passageway showing concrete, stone, and timber walls.
Source: Photograph by author.

refashioned to address present-day needs. Older single-family dwellings have been converted for multifamily occupancy, thereby creating the need for additional space and reconfigurations. These dwellings thus exist at the intersection between the formal and the informal, mutating and reshaping to the needs but also constraints of the dwellers. This material improvisation means that new wires are brought in, PPMs are bypassed through creating a new room, a new wall helps to cool the household and decrease electricity use, or a new utility connection allows the dwellers to charge electricity to the business downstairs.

There emergent knowledge are predicated on improvisation such as constructing houses, plastering walls, and the like. They are ways of understanding the city and the intricate ways in which urban dwellers can operate across the marginal spaces of urban infrastructure. Such ways of developing improvisation are predicated on an experimentation with materials, testing, reflecting, and prefiguring a better tomorrow for the household or wider community. These prefigurative and often tentative processes of (re) arranging materialities remain informal, outside, or at least on the boundaries of prioritized circulations of knowledge, shared by policy makers and engineers, and suggest a different imaginary of the city's infrastructure. For many residents, improvisation as a way to shift material conditions becomes an important part of wider community mobilization and empowerment that reveal new material conjunctures from which to generate and articulate desired futures. Instead of a reliance on the state and large-scale capital investment, improvisation allows urban dwellers to prefigure their own futures. Their actions suggest that incremental infrastructures are not just constituted through improvisation but also through forms of social collaboration and cooperation.

Constituting incremental infrastructures through social collaboration

One way to consider these forms of social collaboration is during moments of conflict when housing and wider infrastructure is under threat from demolition or eviction by municipal authorities. These moments bring together what Simone (2004b, p. 407) terms "provisional intersections of residents," a series of people, practices, spaces, and beliefs that can be understood as a form of social collaboration or "people as infrastructure." These intersections of people are temporary in nature and emerge from multiple social, economic, and community networks to resist demolition and eviction; thus, they become implicated in the constitution and consolidation of incremental infrastructures.

This was vividly brought to life one day when my research assistant and I were about to conduct a workshop in Ga Mashie. The police arrived in pickup trucks alongside Accra Metropolitan Assembly (AMA) officials. They had come to demolish several structures that were crucial to residents' economic livelihoods (bars, mobile phone credit spots, etc.) along the main road and the homes behind, which housed around 80 people. Within minutes, the community had mobilized dozens of people beyond the immediate area to resist the demolition. Word of mouth and mobile phones created what seemed like a spontaneous reaction to defend the dwellings targeted for demolition. The police were armed and pushing people out of the way, but there was little violence during this occasion. A deal had apparently been signed with the bank to buy the land (from a man who claimed to have the land title) and to then demolish the homes and build a branch which would serve the adjacent central business district. A resident stepped forward and demanded to see the court order. When the police and AMA were not able to provide one, residents began to place themselves between the structures and the authorities. They shouted, sang songs, and moved objects to create a barricade. It was clear that the police

and AMA officials could see the difficulty in continuing with proceedings, especially without a court order. The group demanded to see the court order and climbed onto the police vehicles, chanting Ga songs. The police and AMA officials began their retreat and people stood around for a while talking and celebrating before they moved back into the neighborhood and continued with their everyday activities.

After I had spent weeks trying to find out about community mobilization at various workshops and failing to identify formalized social groups, suddenly I had witnessed a people-centered infrastructure utilized to generate a demonstration, an act of resistance to defend other community members. This moment of collaboration and collective network of resistance dissipated as soon as it had emerged. In many regards, such social "infrastructures" are as important to sustaining life in Ga Mashie as the engineered hardware systems of cables, wires, meters, and transformers. The success of this movement was clearly predicated on social connections. Thus, I argue that this mobilization of community members can be considered as an infrastructure, as a temporary configuration of people and a form of social collaboration that served to secure the fundamental need to shelter and the current network configurations of the compounds. Yet this cooperation should be understood as more than a defense against attempted demolition—it is also a community claiming a commons and making clear its intentions for the future of this contested space. Such action was predicated on, in Simone's (2004b, p. 408) framing, "a specific economy of perception and collaborative practice constituted through the capacity of individual actors to circulate across and become familiar with a broad range of spatial, residential, economic, and transactional positions."

Moments such as this were also evident during a neighborhood PPM installation. Some households resisted and called upon social infrastructures to help halt the imposition of these technologies, to consolidate existing incremental adjustments, and to challenge the power of the municipality and utility company to configure infrastructure. As Pieterse, (2008, p. 131) has noted, urban dwellers such as those in Ga Mashie possess an "infinite array of opportunities to refuse, undermine, subvert, frustrate and erode that power."

This episode in the life of the neighborhood shows that incremental infrastructures are constituted and consolidated through "emergent forms of social collaboration" in cities like Accra (Simone, 2004b). It is through these "thickening fields of social relations" (Simone, 2005) that incremental forms of infrastructure are constantly prefigured as social movements, households, neighbors, extended families, and electricians work together to "secure for themselves the ongoing possibility to carve out a viable life" (Simone & Rao, 2012, p. 316). While this can sometimes result in conflict between urban dwellers or fail to achieve objectives, at other times these dynamics can improve socio-environmental conditions and generate conditions of possibility.

Conclusion

In this paper, I have worked through Roy's (2009a, p. 829) critique and subsequent call for action that, "the world is not flat, and it is time to produce a more contoured knowledge of its cities." The paper has engaged with this challenge to expand notions of infrastructure that generate an alternative urban imaginary, or as Simone (2004b) purports, a "city yet to come." This is an idea of the urban beyond the linear narratives of much existing theory, one that mutates and emerges from the so-called "slum urbanism" (Rao, 2006; Swilling, 2011) of places such as Ga Mashie and the future of vast swathes of our urbanized planet. In this paper, I have sought to provide a detailed account of incremental infrastructures in post-colonial Accra. Drawing on existing work and

generating new insights, I have sought to provide evidence for a definition of incremental infrastructures as urban systems in constant movement and flux, to argue they are produced through material improvisation and emergent forms of social collaboration. I argue that these incremental infrastructures need to be considered as the norm, and not the exception, in post-colonial cities such as Accra.

My focus in this paper expands existing work on the incremental to consider the political horizons that emerge from these struggles, experiments, and interventions across the inequalities of contemporary infrastructure systems. I have shown how testing and experimenting with new connections to the electricity system is not simply predicated on accessing energy in the now, but may produce future possibilities for affordable or even free energy for the poor for the neighborhood. I explored the ways in which urban dwellers worked within and beyond households to improvise, through an assortment of materials, new dwelling spaces that may open up economic opportunities, create space for family members to live, and produce improved housing futures. I have described how community members have come together *as* infrastructure to consolidate existing housing and energy networks on disputed land and articulate future claims to these urban spaces. Together these material and social intersections with infrastructure open up new possibilities in socio-environmental relations. They lay a claim in the present to a more just and fair urban future, one that situates urban dwellers as central in engaging in necessary socio-spatial change.

In seeking to better understand this prefiguration, I suggest it is useful to draw on debates within and beyond anarchist geographies (Gordon, 2007; Graeber, 2009; Ince, 2012; Springer, 2012) that have explored the prefigurative in more detail. In such writing, a prefigurative politics is understood as modes of organization and social relations that seek to reflect desired futures or an opening of future possibilities. This paper argues that incremental infrastructures should be understood both materially and socially as prefigurative. Such a perspective provides the terrain from which to think through "conditions of possibility" that may be generated through these interventions (Loftus, 2012) by revealing the power of urban dwellers to confront socio-environmental inequalities and shape infrastructure configurations. As Ince (2013, p. 1653) has argued,

> Through an emphasis on the prefigurative, it may be possible to embed within territorial practices certain organizational functions and structures that are at once effective in building spaces of struggle and developing modes of organisation that prefigure a future world.

This articulation of the prefigurative rejects an end point in urban struggles (Springer, 2012) and applied to thinking through incremental infrastructures show these urban systems to be unfolding territorialities across time and space and as a series of shifting sites for sociomaterial action. Like McFarlane (2011b) writing on improvisation, I suggest an important note of caution when considering the political potential inherent in the incremental nature of infrastructures and the improvisation and social collaboration that characterize many marginalized neighborhoods. For many urban dwellers, these actions are of course part and parcel of ongoing struggles to survive, to secure the essentials and to provide for the family, yet this should not preclude the potential emancipatory politics that the incremental may reveal beyond the survival-driven nature of such interventions as infrastructures in-the-making are adjusted, prefigured, and transformed.

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Note

1. In exploring the political potential of urban dwellers engaging in incremental adjustments to infrastructure, it is worth reflecting on the relationship of the researcher to Accra residents' prefigurative action. Acknowledging the limitations of the ethnographic-based methodology that produces knowledge about actual existing conditions of urbanism in Accra but provides only limited support for residents in Ga Mashie suggests that alternative ways of undertaking research on incremental infrastructures are needed to contribute toward residents' efforts to reshape the city. Such a research methodology would move beyond description to provide a transformative knowledge that results in formalization, protection, and consolidation of such incrementalism through collaborative learning and coproduction and is beginning to emerge in particular contexts. One prominent example is the work of the Transitions Collective in Stellenbosch; see http://www.ishackliving.co.za/

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